Program 7R-2

▸ Rice Irrigation In The Mid-South: Where Do We Head From Here?

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According to the 2010 USA Rice Federation's Environmental Indicators report, the volume of irrigation water required to produce a hundred weight of rice in the U.S. declined by about 40% between 1982 and 2008. Energy use declined by about 53% over the same time period. Producers in Mississippi did their part in these reductions by precision-leveling rice fields beginning in the 1980's. Use of straight-levees increased water savings by about 15% over that of contour levee systems. In the 1990's, Mississippi producers began using multiple (side) inlet irrigation and zero-grade (level basin) systems that increased water-savings by approximately 30% and 50% over that of contour levees, respectively. Currently, over 70% of the rice land in Mississippi has been precision-leveled. More than any other group, rice producers have made steady progress in reducing water inputs while increasing yields.

However, a closer inspection of the Rice Federation's report reveals that most of these water-savings occurred in the 1980's and 1990's as the savings reached a plateau in the 2000's. Similarly, average water use in Mississippi rice production has remained at approximately 36 ± 4 A-inches/A for the past nine years. Adoption of the highly efficient zero-grade systems in Mississippi remains at approximately 5% of rice acres. The limited adoption of this system can be attributed to the issue of water-logging of rotational crops. Growing continuous rice to address the water-logging issue has its own disadvantages (e.g., increased potential for pest resistance) and doesn't allow the producer to benefit from yield gains associated with the 2:1 soybean-rice rotation common to the Delta.

There are pros and cons associated with any irrigation system. Sprinkler-irrigated rice may have a fit for certain growers but most do not expect it, or zero-grade irrigation, to become the method used to grow the majority of rice in the mid-south. Early flood termination reduces water use, but can be risky as producers can not know how hot and dry the end of the growing season will be. On-farm reservoir and tailwater recovery systems represent an outstanding means to reduce water and energy use, but current installation costs are estimated to be approximately $1,800 to 2,000 per A. Similarly, irrigation pump-control systems offer the convenience of remote pump shut-off and system monitoring along with potential water and energy savings. However, these devices are still largely under development and their current cost may prohibit widespread adoption in the short term. Moreover, current efforts to develop drought-tolerant rice are mainly directed towards rainfed production settings common to developing countries, not the mid-south.

So what water-conserving option exists that is available to the majority of mid-south rice producers today? Multiple (side) inlet irrigation has a proven track record as an economical means to conserve water and energy and is the most readily-available option applicable to the majority of rice acres in the mid-south. However, the adoption rate of this system is estimated to be at only 20% of the rice acres in Mississippi. Multiple-inlet irrigation is known to reduce water use by about 15% and has many other benefits such as reduced cold-water rice and improved nitrogen management. As important, it serves as a platform upon which additional water-savings often approaching those of zero-grade systems can be attained with no additional input costs.

This presentation will highlight findings from nine years of on-farm research and demonstration. On average, Mississippi rice producers that have combined straight-levees with multiple-inlet irrigation distribution and intermittent flood management have used approximately 22 A-in/A irrigation water versus 20 A-in/A used by zero-grade. To date, there have been no significant rice yield or milling quality differences observed between intermittently- and continuously-flooded plots. Increased rainfall capture and reduced over-pumping associated with intermittent flooding, and the ability of rice to thrive in a non-continuously-flooded environment, help to explain these results.